THE FARMER OF TOMORROW

Man is nature's supreme egotist. The more unlearned a man is the more self-satisfied he usually is with his individual mental independence. Up to very recent years farming was considered a trade that needed no study and no cultivation of the mind. Not a man among us but can remember the scorn with which the average farmer regarded attempts to develop the agricultural college. What had been good enough for his father was good enough for him and it was going to be good enough for his son * * *.

The American farmer today who cannot read and write is a curiosity. The newspaper, the farm journal, the telegraph, the telephone, the radio, the auto on the cross country roads, the network of railroads and improved waterways, the enormous growth in the last hundred years of our great cities, the development of specialty farming, all these had combined even before the war, to give birth to the idea that farming must speedily develop just as efficient methods of production, preparation, and marketing as any other great manufacturing business. In general the old method from hand to mouth, from milk pail to cream in the coffee, from hoof to table had already gone into the discard. Farmer's Cooperatives had already begun to follow in the footsteps of the great citrus fruit organizations. The agricultural department at Washington had enormously extended its efforts for the benefit of agriculture in general * * *.

If the city man doubts that the farmer has the brain and the mental force to work out his own salvation let him note the fact that the larger portion of our "captains of industry" were men who were born and spent their boyhood days on the farm. The soil is the mother of the nation, and the farm does grow the fresh new original brains of the country as well as the fresh new green vegetables, meat, cotton and wool. That the man of the soil has not actually controlled and consciously directed the life and policy of the nation is solely because he has always been steeped in supreme original egotism, unwilling to take advice, backward about working in harmony with his neighbor, and certain that there was something mysterious and strange and magic about the way the city man did business and piled up the glory of urban wealth and splendor that met his eye on his rare trips to the big town. But the present universal dissemination of real knowledge is rapidly changing his bucolic attitude; * * *.

Just in the last few years has the American farmer begun to get this (a true) perception of the world-wide significance of the word neighbor. Also the effective tools of communication between neighbors are today

world-wide in their distribution and their action. There are many farm journals in this country today with a subscription list of over a hundred thousand and several whose distribution comes near to a million. It is claimed that one-tenth of the farms of this country already have radio receiving sets installed, and are thus linked up mentally with a host of neighbors. The very air is full of mysterious pulses of neighborliness. Do not think for a moment that the American farmer is so dense as not to take advantage of these present day considerations * * *.

There is no question but that reasonable demand for any farm staple will steadily increase over the years, and that prices in general will, over a period of years, show a general advance. Therefore, it is only a question of the proper adaptation of the products of the land to the demands in the world markets for them. Such intelligent cooperation clear through from cultivation of the soil to advertising and marketing will allow all the arable land of the world to be developed and used profitably. Agriculture is the only business that has a grand and unlimited future before it. The next ten years are going to show that the man who lives upon the land and takes advantages of experience is the only true aristocrat. The intelligent oversight of his efforts must be applied by logical cooperation all the way through as it is not today * * *.

The door of agriculture's greatest opportunity is before us. The key for its opening is called practical education, which widens and develops the farmer's mental horizon. A strong back and a weak brain are no longer the prime requisites for successful farming. The door will not yield to a crowbar in the brawny hands of toil without an equally effective mental force directing the effort. Isolation on the farm is a thing of the past. The lesson must be learned that every farmer is a unit stockholder in the greatest organized business in the world. Give the logic of cooperation an effective boost and carry it clear back to the plan behind the planting of the crop. That will put the percentage back where it belongs in the ledger of the year's work. It means satisfaction and success for every man who is willing to work comfortably with his neighbors.—Wm. B. Smith in *California Cultivator.*

"All the world cries, 'Where is the man who will save us? We want a man! Don't look so far for this man. You have him at hand. This man—it is you, it is I; it is each one of us! * * *. How to constitute one's self a man? Nothing harder, if one knows not how to will it; nothing easier, if one wills it."—Alexandre Dumas.

THE GREAT TYPHOON OF NOVEMBER 5–6.[1]

The night of November 5, from 11:00 p. m. extending into the morning of November 6 until 3:00 a. m., was a period of terror and destruction for three of the provinces of Central Luzon. A typhoon of unusual intensity passed over this region, leaving chaos in its wake. Naturally typhoons are regular yearly visitations in the Philippines, but the present one was very unusual in several respects. Apparently it hung off the east coast of Luzon for several days almost stationary and then without any warning, leaped upon the country at high speed. It was a very high speed typhoon in two respects. The movement about the center and the movement forward of

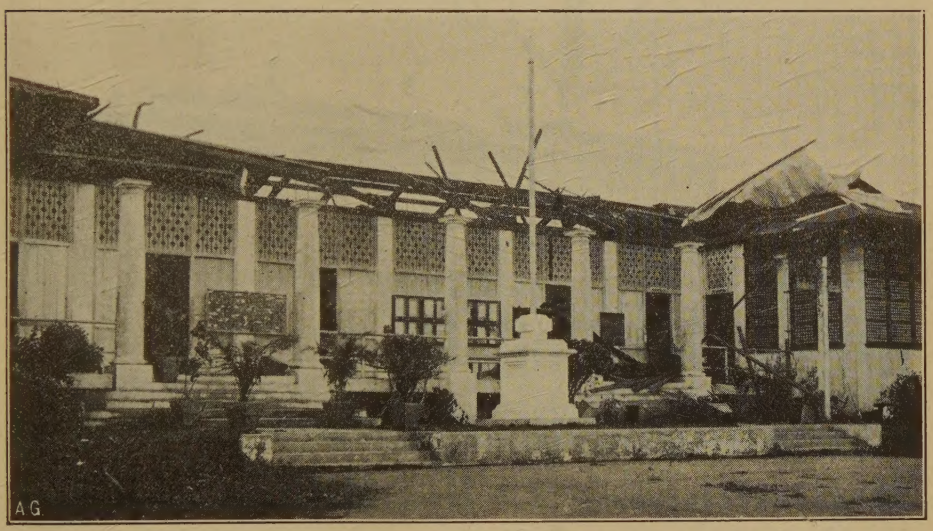

Fig. 1.—The Administration Building—the morning after.

the storm as a whole were both of extraordinary speed. Its path was comparatively narrow and instead of proceeding, as most typhoons do, from southeast to northwest, it recurved to the southwest as it passed through the Islands and as last heard from, was entering southern Indo-China.

The College of Agriculture was within the path of the high wind and destruction on the College grounds was very considerable, several of the College buildings being partly unroofed and great destruction occurring in cultures and among tree growths on and around the Campus. Great

[1] General contribution from the College of Agriculture No. 178.

numbers of native houses were razed, including the entire barrio of the self-supporting students on the slope of Copeland Hill. Here, some 30 houses were destroyed and a large number of students left without shelter. At this writing (November 15) debris has been largely cleared away and active repair and restoration is on the way. Classes had to be dismissed for the first three days of the following week but were resumed on November 11. This quick recovery has been due to two things. First and foremost comes the fine spirit of the faculty and student body which in any other country might be considered very remarkable but which here is more or less due to the fact that Filipinos are quite accustomed to this sort of thing and take it very much as a matter of course. Every one connected with the College

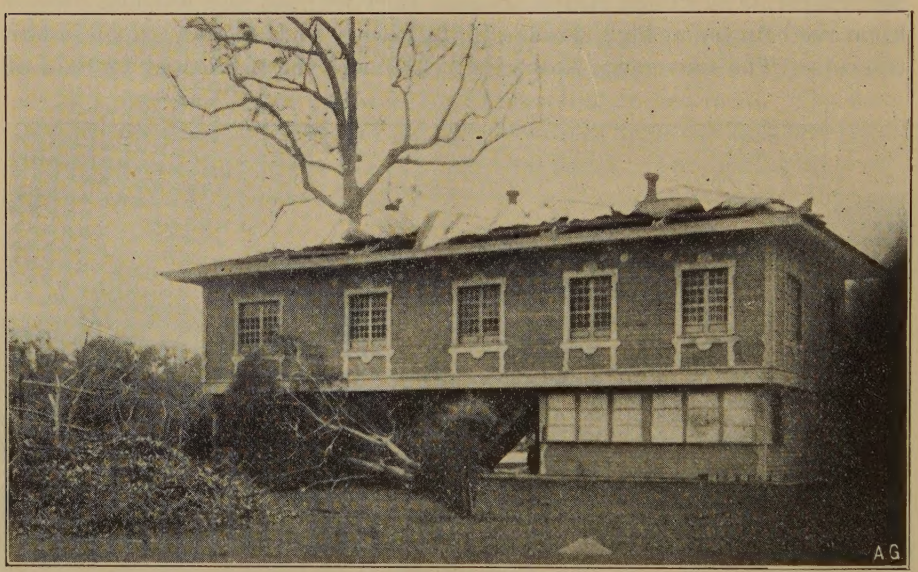

Fig. 2.—The Soils Building roof was a bit jazzed.

jumped quickly into the work of salvage and repair. Students who lost houses immediately began the reconstruction of them. Quick action by the President of the University and the Board of Regents in supplying an emergency fund made possible the rapid repair of University buildings and beginning attack on the restoration of the grounds.

Los Baños was extremely fortunate in not suffering any deaths. At various other points in the way of the storm, the casualties were very numerous and in many regions the people are suffering severely from the effects of the calamity.

Staff members were "hard hit"—some of their houses being unroofed and some being partially or wholly destroyed. Several will require rebuilding.

Interesting and important aspects of the typhoon appear in various results concerned with plant physiology, plant pathology, entomology, and production of tree crops. These matters will all be followed up actively. The Laguna-Tayabas coconut district—one of the largest in the world—suffered loss and injury variously estimated at from 20 to 40 per cent. We are taking active steps to secure accurate measurement of this, and particularly as to period of recovery.

C. F. Baker,
Dean, College of Agriculture.

Fig. 3.—The Co-op. A neat bit of unroofing.

Fig. 4.—A faculty house on Faculty Hill that stood in the way of Sir Typhoon. This was the residence of Dean of College of Veterinary Science. It was formerly the "Bachelor Mess".

Fig. 5.—Early in the morning. Students looking for Lab. note books, shoes and such in Students' Barrio, Copeland Heights.

Fig. 6.—The student owners of this house before the collapse wisely took refuge in the barrio concrete bath house. Here with others, they sang "Home Sweet Home", when they heard the crack and crash of their houses going down.

MACROPHOMA MUSAE (CKE.) BERL. AND VOGL. AND PHOMA MUSAE CARPENTER[1]

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Of the Department of Plant Pathology

WITH ONE TEXT FIGURE

In 1919 Carpenter reported that the banana freckle, or black spot disease, was doing serious damage to the Chinese banana (*Musa cavendishii*), in Hawaii. He described the causal fungus as a new species of *Phoma* and named it *P. musae*. The freckle, or black spot disease of banana and plantain has been present in the Philippine Islands probably ever since banana was cultivated in this country. It occurs on practically all of the important varieties, as Saba (*Musa sapientum* L. var. *compressa* (Blco.)

Fig. 1.—(*a*) Portion of the cross section of a pycnidium of *Macrophoma musae* (Cke.) Berl. and Vogl. showing a few of the pycnospores still attached. ×480. (*b*) Pycnospores of *M. musae* showing the granular contents, appendage, and the gelatinous matrix. ×480. (Drawn by Macario A. Palo with the aid of a camera lucida from free hand sections of fresh materials.)

Teodoro), Lacatan (*M. sapientum* L. var. *lacatan* (Blco.) Teodoro), Latundan (*M. sapientum* L. var. *cinerea* (Blco.) Teodoro), and others. Reinking (1918 and 1919) reports the disease on banana and abacá, or Manila hemp (*Musa textilis* Née). In the Philippines the disease does not seem to cause much damage because the causal fungus very rarely goes deeper than the peel of the fruit and freckled bananas are not usually discriminated against on the market.

[1]Experiment Station contribution No. 406. Received for publication October 18, 1926.

Banana freckle is shown on leaves and fruits by numerous minute, grayish or brown to dark brown raised spots with black dots in the center. On the fruit the spots are about one millimeter in diameter. They are more or less rounded and the border is indefinite. On the leaves the lesions are not as much raised as they are on the fruits. The spots are more abundant on the upper than on the lower surface of the leaves. The upper exposed parts of the fruits may be entirely covered with the freckles, which are surrounded by a narrow band of more or less water-soaked tissues. The freckle, or black spot lesions are rough to the touch owing to the protrusion of clusters of very minute and black colored pycnidia at their center. As several pycnidia are produced at the center of the raised lesions, the group of the fruiting bodies may be large enough to be visible to the unaided eye as black dots. On account of the great number of the lesions, affected leaves and fruits may appear blackish. On the lesions the black color of the pycnidia disappears as soon as the pycnospores are liberated. Because the pycnospores disappear, the affected leaves and fruits may appear light brown instead of blackish later in the season. Under field conditions the spread of the fungus on the leaves and fruits seems to be due to rain water. Secondary infections occur after rain and the lesions are produced only on portions which were washed by the conidia-laden rain water.

Regarding the causal fungus, the writer noted that Saccardo (1884) described an organism on plantain as follows:

> "593. *Phoma Musae* (Cooke) Sacc. *Sphaeropsis*? *Musarum* Cooke in Grevillea.—Peritheciis semiimersis, atris, nitidis, subconicis, in maculis parvulis congestis; sporulis subglobosis vel ovatis vel ellipticis, hyalinis, 12–22 $\simeq$ 10–14; basidiis nullis visis.
>
> *Hab.* in Musa paradisiaca, Belgaum in India orientali."

Two years later Saccardo's *Phoma musae* (Cke.) was redescribed by Berlese and Voglino in *Atti Soc. Veneto-Trentina* as *Macrophoma musae* (Cke.).

Evidently, Saccardo accepted Berlese and Voglino's new combination as correct, because eight years later he (Saccardo, 1892) listed the same fungus as *Macrophoma musae* (Cke.) Berl. and Vogl.

Carpenter (1919) described *Phoma musae* on banana in Hawaii, and Lee (1922) reported that the same fungus is present in the Philippine Islands. In 1913, however, H. and P. Sydow (1913) identified the black spot fungus on banana leaves from the Philippines with *Macrophoma musae* (Cke.) Berl. and Vogl. Baker (1914) listed the banana leaf spot fungus as identified by Sydow.

Measurements made by the writer at Los Baños, Laguna, Philippines, in April, 1925, at the request of Dr. Otto A. Reinking of the United and Fruit Company and studies made by Mr. Macario A. Palo of the Department of Plant Pathology in October, 1926, gave results which correspond very closely

with those reported by Carpenter (1919) in Hawaii. The pycnidia of the Philippine *Macrophoma musae* (fig. 1a) are 48–176 μ while those of Carpenter's *Phoma musae* are 60–150 μ; usually they are 135 μ. The pycnospores of the Philippine fungus (fig. 1b) are ovoid, and hyaline. They are inclosed in a hyaline gelatinous sheath which is 0.36–1.85 μ wide, each being provided with a hyaline appendage,[2] and filled with very granular contents. The conidia of the Philippine *Macrophoma musae* are 8.5–20.0×6.8–11.8 μ, while Carpenter (1919) reports that in his Hawaiian *Phoma musae* they are 10.0–17.5×5.0–12.2 μ. The pycnospores of the Philippine fungus correspond closely in size, shape, and other characteristics with *Phoma musae* Carpenter. As stated above the Philippine black spot fungus of the banana was identified by Sydow (1913) with *Macrophoma musae* (Cke.) Berl. and Vogl. It would seem, from the apparent identity of the fungus from the Philippines with that from Hawaii, that the cause of the banana freckle, or black spot disease of banana and plantain should be known as *Macrophoma musae* (Cke.) Berl. and Vogl. instead of *Phoma musae* Carpenter. If the species belongs to the genus *Phoma* by reason of priority, it should be known as *Phoma musae* (Cke.) Sacc. and not *Phoma musae* Carpenter. But according to Berlese and Voglino, *Phoma musae* (Cke.) Sacc. is *Macrophoma musae* (Cke.), and Saccardo (1892) apparently accepted the new combination and listed the binomial *Macrophoma musae* (Cke.) Berl. and Vogl. in 1892. Would it not be an act of justice to reduce *Phoma musae* Carpenter to a synonym of *Macrophoma musae* (Cke.) Berl. and Vogl.?

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Sydow, H. and P. 1913. Enumeration of Philippine fungi with notes and descriptions of new species, II. Philippine Jour. Sci. Sec. C **8**: 475–508. *Fig. 1–7.*

[2]The failure of mycologists to report the presence of gelatinous matrix and appendage of pycnospores of *Macrophoma musae* (Cke.) Berl. and Volg. is probably due to the fact that they were using dried materials.

INFLUENCE UPON THE DEVELOPMENT OF YOUNG RICE PLANTS OF SODIUM CHLORIDE ADDED TO A COMPLETE SOLUTION[1]

FERNANDO DE PERALTA[2]
Of the Department of Plant Pathology

Sodium chloride is known to influence the growth and development of plants. Rice plants are reported to be able to thrive well in paddies where common table salt is added in limited amounts. This salt serves as a stimulant. But literature does not show which constituent of this salt, —the entire molecule, or the ions, sodium and chloride—gives the beneficial effects to the rice plant. It was the object of this study to determine the influence upon the development of young rice plants of sodium chloride added to a complete culture solution and to find out which constituent of this salt gives the stimulating effect or the nutritive value.

This study was carried out in the laboratory of the Department of Plant Physiology of the College of Agriculture, Los Baños, during the months of March, April, and May, 1925.

MATERIALS USED

The plant

Lowland rice plants, variety Roxas, were used as the living indicators of results of this study. The seeds, obtained from the Department of Agronomy of this College, were soaked in water and sprouted between two moist blotting papers. When the plumules and the radicles were out of the seed coats, the seeds were spread on a piece of paraffined bobbinet which was stretched horizontally over the mouth of a large glass jar filled with tap water. The jar was kept always full of tap water.

When the shoots of the seedlings were about seven centimeters high, apparently uniform healthy plants were selected. These young plants were set in paraffin-coated-cork stoppers, which had four holes each. Through each of these holes the shoot of a seedling was inserted and held in place by means of a piece of absorbent cotton. Then the preparations were placed in culture bottles containing the nutrient solutions previously prepared for the purpose.

[1] Experiment Station contribution No. 407. Received for publication October 21, 1926.
[2] Thanks are due Dr. R. B. Espino, Acting Head of the Department of Plant Physiology, for encouragement and suggestions given during the progress of this study and during the preparation of this paper.

Solutions

Espino's best culture solution of the "4–salt type A" (1920) made up of one part of mono-potassium phosphate (KH_2PO_4), one and one-half parts of ammonium sulfate $(NH_4)_2SO_4$, one and one-half parts of calcium nitrate $(Ca(NO_3)_2)$, and four parts of magnesium sulfate ($MgSO_4$), with a concentration of 0.002 gram-molecule of all the salts taken together per liter was used. All the salts employed in this study were "Baker analyzed" (manufactured and analyzed by J. T. Baker Chemical Company). For the sake of convenience, the different sets, or series of experiments performed are here separately presented.

EXPERIMENTS

Experiment 1

Object. It was the object of this experiment to find out the influence upon the development of young rice seedlings of sodium chloride added to Espino's best culture solution.

Preparation of culture solution. The solution of sodium chloride was first prepared in one-tenth (M/10 NaCl) concentration. The salt was dissolved in distilled water and the solution was stored in a bottle.

The culture solutions were next prepared as follows: 1 cc. of M/10 NaCl was put in a 500 cc. volumetric flask, to which was added enough of Espino's best culture solution of the "4-salt type A" to make up 500 cc. solution, or mixture. This mixture contained 1 cc. M/10 molecular solution of sodium chloride and 499 cc. of Espino's best culture solution, and is here designated as culture No. 1. Another culture solution designated as culture No. 2 was prepared by mixing 2 cc. of the M/10 molecular solution of sodium chloride and 498 cc. of Espino's solution. The other culture solutions employed in this study were prepared in a similar way but, as shown in table 1, with varying amounts of the solution of sodium chloride and the standard Espino's culture nutrient. Each culture was run in duplicates. Control cultures containing only Espino's solution were run simultaneously with the other cultures. The cultures were placed in a glass compartment in the Plant Physiology laboratory of the College. To keep the roots in darkness the culture vessels were wrapped with manila paper. The seedlings were allowed to grow in the culture solution for 30 days, at the end of every three days the culture solutions were changed. At end of 30 days the seedlings were carefully removed from the culture bottles and dried to constant dry weight in a Freas electric oven.

Criteria considered. The criteria employed in this study and also for the subsequent experiments were:

1. Color of the leaves.
2. Dry weight of tops.
3. Dry weight of roots.
4. Dry weight of tops and roots combined.

TABLE 1

Showing the composition of culture solutions employed in experiment I and the results obtained

CULTURE NO.	CULTURE SOLUTION[c]		DRY WEIGHT OF TOPS		DRY WEIGHT OF ROOTS		DRY WEIGHT OF ROOTS AND TOPS	
	Amount of M/10 NaCl present	Amount of Espino's solution	Set I[a]	Set II[a]	Set I	Set II	Set I	Set II
			Relative value	Relative value	Relative value	Relative value	Relative value	Relative value
	cc.	*cc.*						
1	1.00	499	96.8	92.9	100 (0.126 gram)	71.4	97.8	91.1
2	2.00	498	94.3	97.7	69.8	100[b] (0.1344 gram)	87.7	93.3
3	3.00	497	99.3	97.4	98.1	69.2	99.3	86.2
4	4.00	496	79.6	76.9	84.8	74.3	81.0	81.0
5	5.00	495	98.6	100[b] (0.4828 gram)	94.2	74.3	98.0	97.6
6	6.00	494	100[b] (0.4712 gram)	93.8	97.7	87.7	100 (0.5946 gram)	95.6
7	7.00	493	96.6	98.4	91.2	90.7	95.7	100 (0.597 gram)
8	8.00	492	88.9	95.2	83.3	74.3	89.6	93.7
9	9.00	491	97.1	67.3	85.6	67.7	95.0	69.6
10	10.00	490	74.3	91.9	71.4	52.1	73.9	86.0
11	Control	500	94.4	97.8	83.2	63.2	92.4	85.2

[a] Sets I and II are duplicate cultures.
[b] The highest actual dry weights of top and also of roots were taken as 100; the other values were determined relatively.
[c] 0.25 cc. of ferric phosphate was added to each culture medium of 500 cc.

Results. The data of results from this experiment are given in table 1.

Discussion of results. The leaves of all the plants grown in this set of cultures were normal green. The data in table 1 show that in some of the cultures to which sodium chloride was added the dry weights of tops and roots of plants obtained were heavier than the dry weights of tops and roots obtained from the control, that is, from the cultures which did not receive any sodium chloride. However, the plants grown in culture vessels Nos. 2, 4, 8 and 10 of set I and Nos. 4 and 10 of set II produced less dry weights of tops and roots than the control plants. The dry weights of tops and roots taken together of culture No. 6 of set I was 0.5946 gram, and of culture No. 7 of set II 0.5970 gram, while in the two control cultures the weights were 0.5498 gram, and 0.5088 gram. Expressing the results obtained from these cultures in terms of relative values, culture No. 6 in set I and culture No. 7 in set II, each had a value of 100, each being the heaviest in the set, and the two control cultures had values of 92.4, and 85.2.

Culture No. 6 of set I contained 6 cc. of M/10 NaCl and culture No. 7 of set II had 7 cc. of M/10 NaCl. The other cultures which had different amounts of sodium chloride added in quantities varying from 1 cc. up to 10 cc. of M/10 NaCl, (see table 1), also had lighter dry weights of tops and of roots and tops taken together than cultures No. 6 of set I and of culture No. 7 of set II. Moreover, it may be noted in table 1 that when the amount of sodium chloride added was 10 cc., the dry weights of tops and of tops and roots taken together were lighter than the dry weights of the plants grown in the control solution. This result seems to suggest that this amount of sodium chloride was too much for the need of the young plant, and that the amount of M/10 solution of sodium chloride optimum for the growth of the seedling was around 6 or 7 cc. In other words, when sodium chloride was added in the right quantity to Espino's culture solution a better growth and development of the rice seedlings was obtained. It may not be amiss to state in this connection that the results of the preliminary researches conducted by Mr. R. P. Estioko of this department show that the best culture solution for rice seedlings under Philippine conditions was the same as the one found by Doctor Espino as the best for seedlings of another variety of rice grown under green-house conditions in Baltimore, United States. This fact conclusively demonstrates that sodium chloride when used moderately is beneficial to the young rice plant,—a case quite in accord with the findings of Rudolfs (1919) who worked on the "Influence of Sodium Chloride upon the Physiological Changes of Living Trees."

Experiment 2

Object. The object of this experiment was to determine once more the influence of NaCl on the development of young rice plants. In this experiment, in some of the cultures, the amounts of the standard complete culture solutions employed were made constant, and the amounts of the NaCl, variable.

Method of experimentation. Two sets of cultures, designated as series A and B, were started. The series B was exactly the same as the one described under experiment 1, except that a smaller number of cultures was employed. In this work only cultures 2, 4, 6, 8 and 10 shown in table 1 were used, for the reason that the results obtained in experiment 1 demonstrated that the optimum growth of the rice seedlings was obtained somewhere in culture No. 6.

Series A differed from series B in that different amounts of sodium chloride used,—2 cc., 4 cc. etc., were added to 500 cc. of Espino's culture solution, making the total volumes, 502 cc., 504 cc., etc.; while in series B, the amount of sodium chloride added was diluted to the total volume of 500 cc. by adding Espino's solution. That is, if 2 cc. of the solution of NaCl were used, 498 cc. of Espino's culture solution were added to make a culture solution of 500 cc.

Five cultures in series A were tried. Culture 1 contained 2 cc. of M/10 NaCl and 500 cc. of Espino's culture solution; culture 2 contained 4 cc. of M/10 NaCl and 500 cc. of Espino's culture solution; culture 3 contained 6 cc. of M/10 NaCl and 500 cc. of Espino's culture solution; culture 4 contained 8 cc. of M/10 NaCl and 500 cc. of Espino's culture solution; and culture 5 contained 10 cc. of M/10 NaCl and 500 cc. of Espino's culture solution. The proportions of the constituents of the cultures in series A and B are shown in table 2.

TABLE 2

Showing the composition of the culture solution employed in experiment II

CULTURE NO.	SERIES A			SERIES B		
	Amount of NaCl M/10 present	Amount of Espino's solution	Total volume	Amount of NaCl M/10 present	Amount of Espino's solution	Total volume
	cc.	*cc.*	*cc.*	*cc.*	*cc.*	*cc.*
1[a]	2	500	502	2	498	500
2	4	500	504	4	496	500
3	6	500	506	6	494	500
4	8	500	508	8	492	500
5	10	500	510	10	490	500
6	Control	500	500	—	500	500

[a] 0.25 cc. of ferric phosphate was added to each culture medium.

When the culture solutions in series A and B were ready, uniformly developed rice seedlings fitted in cork stoppers in a manner similar to those employed in experiment 1, were grown in each. Control cultures containing no salts, except Espino's culture solution, were employed to check the results obtained from the test cultures.

Criteria considered. The criteria of results considered were the same as those employed in experiment 1.

Results. The results are recorded in table 3.

TABLE 3

Showing the effect upon development of young rice plants of sodium chloride added to Espino's best culture solution

CULTURE NO.	AMOUNT OF NaCl M/10 PRESENT	DRY WEIGHT OF TOPS				DRY WEIGHT OF ROOTS				DRY WEIGHT OF TOPS AND ROOTS			
		Series A[a]		Series B[b]		Series A		Series B		Series A		Series B	
		Average	Relative value	Average	Relative value	Average	Relative value	Average	Relative value	Average	Relative value	Average	Relative value
	cc.	*gram*		*gram*		*gram*		*gram*		*gram*		*gram*	
1[c]	2.0	0.602	79	0.625	83	0.170	74	0.177	92	0.772	79	0.802	85
2	4.0	0.759	100	0.697	92	0.230	100	0.192	100	0.989	100	0.889	94
3	6.0	0.710	93	0.757	100	0.214	93	0.188	98	0.924	92	0.945	100
4	8.0	0.666	88	0.658	87	0.199	86	0.175	91	0.864	87	0.833	88
5	10.0	0.653	86	0.603	80	0.185	80	0.145	75	0.837	85	0.748	79
Control	None	0.682	90	0.682	90	0.161	70	0.161	84	0.842	85	0,842	89

[a] Series A—The volume of Espino's best culture solution was made constant—500 cc.
[b] The volume of Espino's best culture solution was variable.
[c] 0.25 cc. of ferric phosphate was added to each culture medium.

Discussion of results. The leaves of the plants in all of the cultures in this experiment were green. However, the two sets of cultures in series A and B differed in that in terms of dry weights of tops and of tops and roots taken together, the best developed plants, that is the plants that had the heaviest dry weight, were not obtained from the culture media which received the same amounts of sodium chloride. The heaviest plant in series A was obtained from the culture medium that had 4 cc. of M/10 NaCl and 500 cc. of Espino's solution; while the best plant in series B was from the culture medium containing 6 cc. of M/10 NaCl and 494 cc. of Espino's solution. Each of these best developed plants from each series was better than the control plants, a fact which further indicates that the addition of a certain quantity of sodium chloride to Espino's culture solution would improve its nutritive value for the young rice plants.

Experiment 3

Object. The results obtained from the previous experiments show conclusively that NaCl, when used in limited amounts, is beneficial to young rice plants. The question now arises, what is in NaCl that stimulates the growth and development of the young rice plant? Is it the Na-ion or the Cl-ion, or both? To determine this was the object of experiment 3.

Method of experimentation. Eight duplicate culture solutions, each culture containing 500 cc. of Espino's best culture solution of the "4-salt type A," were prepared. To each of these culture solutions were added 4 cc. of one-tenth gram-molecular solution of each of the following salts: sodium chloride (NaCl), potassium chloride (KCl), calcium chloride ($CaCl_2$), magnesium chloride ($MgCl_2$), ammonium chloride (NH_4Cl), monosodium phosphate (NaH_2PO_4), sodium nitrate ($NaNO_3$), and sodium sulfate (Na_2SO_4). Uniformly developed rice seedlings were placed in these solutions to grow, two plants in each solution. The solutions were renewed every three days and at the end of 30 days the plants were harvested separately, dried, and the dry weight of tops and of roots was determined separately.

Results. The results obtained from this set of experiments are shown in table 4.

Discussion of results. As recorded in table 4, the plants grown in the different culture solutions tested, exhibited marked differences in color. The leaves of the plants grown in the culture solutions containing KCl, NH_2Cl, or NaCl had normal green color; whereas the leaves of the plants grown in the culture solution containing $NaNO_3$ Na_2SO_4, or NaH_2PO_4, were pale yellowish green,—a fact which seems to indicate that the presence of chlorine in a complete culture medium is conducive to greening of the leaves of the plant grown therein, and that sodium seems not to possess such a power.

The apparent nutritive superiority of Cl-ion over the Na-ion is again shown by the data on dry weights of the plants or of their parts given in table 4. The dry weights of the plants grown in Espino's solution to which chlorine-bearing salts were separately added were greater than the dry weights of the plants supplied with Na-ions in the same Espino's complete solution. This finding corroborates Osterhout's (1908) conclusion to the effect that "Na has no nutritive function in plants but only a protective function".

Comparing the nutritive or the stimulating effect of the five chlorine-bearing salts,—KCl, NaCl, NH_4Cl, $MgCl_2$ and $CaCl_2$, employed in experiment 3, it may be seen in table 4 that in color of the leaves and in term of the dry weights of the plants (roots or tops, and roots and tops combined), KCl is apparently the best source of chlorine. The plants obtained from the cultures with KCl were of normal green color and had the highest dry weights. KCl was found to be a better source of chlorine than NaCl and the plants grown in the solution without Cl but with Na were poor plants. These facts plainly indicate again that it is the Cl-ion, and not the Na-ion, that gives the stimulating effect on the growth and development of young rice plants. This finding corroborates not only Osterhout's conclusion on a similar subject but also that of Bolin (1913) who states that "the influence of the NaCl used depended on its chlorine content, but not on its content of sodium."

SUMMARY OF RESULTS

The results of the three sets of experiments conducted may be summarized as follows:

1. The addition of a moderate quantity of sodium chloride to Espino's best culture solution on the "4-salt type A" materially improved the nutritive value of the solution.

2. In sodium chloride, it was the chlorine-ion that was beneficial to the rice seedling and not the sodium-ion.

3. Potassium chloride was found to be a better source of chlorine than NaCl and NaH_2PO_4 proved harmful to the young rice plants.

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TABLE 4

upon the development of rice seedlings of the different kinds of chlorine bearing salts added to Espino's best culture solution

COLOR OF LEAVES		DRY WEIGHT OF TOPS		DRY WEIGHT OF ROOTS		DRY WEIGHT OF TOPS AND ROOTS		AVERAGE RELATIVE DRY WEIGHT OF—		
		Set I	Set II	Set I	Set II	Set I	Set II			
Set I	Set II	Relative value	Relative value	Relative value	Relative value	Relative value	Relative value	Tops	Roots	Tops and roots
'een	dark green	100 (0.52 gram)	100 (0.44 gram)	100 (0.093 gram)	100 (0.08 gram)	100 (0.613 gram)	100 (0.52 gram)	100	100	100
'een	dark green	77	86	91	83	79	86	85.5	87.5	82.5
'een	dark green	70	77	74	80	70	78	73.5	77.0	74.0
'een	light green	50	51	46	50	49	50	50.5	48.0	49.5
een	light green	44	55	43	54	44	54	49.5	48.5	49.0
'een	light green	36	45	34	38	36	44	40.5	36.0	40.0
'en	pale green	29	45	32	38	30	44	37.0	35.0	37.0
llowish green	pale yellowish green	28	42	28	40	28	42	35.0	34.0	35.0

Results of experiment 3 showing relative effec

CULTURE NO.	COMPOSITION OF CULTURE SOLUTION[a]	TOTAL HEIGHT		
		Set I	Set II	
		cm.	*cm.*	
1	4 cc. M/10 KCl+500 cc. Espino's solution	45.0	44.6	dark g
2	4 cc. M/10 NaCl+500 cc. Espino's solution	45.0	41.3	dark g
3	4 cc. M/10 NH_4Cl+500 cc. Espino's solution	44.8	40.0	dark g
4	4 cc. M/10 $MgCl_2$+500 cc. Espino's solution	36.8	32.4	light g
5	4 cc. M/10 $CaCl_2$+500 cc. Espino's solution	35.0	33.5	light g
6	4 cc. M/10 Na_2SO_4+500 cc. Espino's solution	30.8	31.0	light g
7	4 cc. M/10 $NaNO_3$+500 cc. Espino's solution	28.0	29.8	pale gr
8	4 cc. M/10 NaH_2PO_4+500 cc. Espino's solution	27.8	28.5	pale ye

[a] 0.25 cc. of ferric phosphate was added to each culture medium.

DEVELOPING THE CANTONESE CHICKEN[1]

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WITH TWO PLATES

The Cantonese is a non-standard breed of poultry introduced into the Philippines from the vicinity of the city of Canton, China, whence it received its local name, Cantonese (Fronda, 1924). This fowl has become very popular in the Philippines and it can now be found in many places either as "pure" Cantonese or as grades in varying degrees of intensity with either the Native fowl or the Rhode Island Red. Unlike the Orpington, the Leghorn, the Rhode Island Red, the Plymouth Rock and a score of other breeds, the Cantonese has responded very favorably to local environmental conditions and the native methods of feeding, care, and management (Fronda, 1924). Where the Cantonese has improved without further importations of these fowls to supply "fresh blood," the other imported breeds have failed.

The Cantonese has kept up and shown a tendency to improve under local conditions. The College of Agriculture strain of the Cantonese, particularly, has reached a standard of development where their size and uniformity of color are beginning to attract the attention of an interested public. How this level was attained presents an interesting story, the facts of which might be a strong recommendation for the Cantonese should it aspire for the position as the leading fowl for the Philippines. This paper is presented to this body with the object of giving additional facts that may support the claim made by Lindayag seven years ago (1918) that the Cantonese is well adapted to the local conditions, and for this reason, may be some day an important asset in the poultry industry on this part of the globe (Fronda, 1924).

THE ORIGINAL FLOCK OF CANTONESE FOWLS IN THE COLLEGE OF AGRICULTURE

The first introduction of the Cantonese fowl into the College was made some time in 1916 when two dozen Cantonese eggs were obtained from the Bureau of Agriculture, Manila. This was the only introduction into the College of Cantonese, as several attempts to secure other strains from other places proved futile.

The original Cantonese fowls were small and had "a great deal of variation in the plumage, as well as in shape". Some were buff, others were buff

[1] Experiment Station contribution No. 408. Paper read before the Los Baños Biological Club, June 25, 1925. Received for publication, September 24, 1926.

with a considerable mealy sprinkling all over the body, especially over the cushion feathers among the females, and still others were either very light or very dark in color. The shank and skin colors were quite variable. The shanks were either white or yellow or greenish yellow. The eggs were very small and the color of the egg shell varied from pure white to varying shades of brown. The birds were loose feathered, "more or less of a meat type, but too small to be used as a meat bird" (Fronda, 1920). They were, however, very hardy and very resistant to disease (Lindayag, 1918).

THE PRESENT STOCK

In contrast with the original flock, the Cantonese fowls now in the College are uniform in color. Among the females the general ground color is a rich golden buff with a clear Columbian pattern. There is a considerable black striping extending down the middle of each hackle feather at the lower part of the neck, a few black primary and secondary feathers in the wings, the main tail feathers are all black, and the balance of the surface is a rich golden buff. This Columbian pattern is more marked in the females than in the males, among which the color is towards a darker buff, frequently approaching a shade lighter than that of a Rhode Island Red male. The birds are very uniform in their combs, faces, wattles, and ear lobes which are all bright red; and in the skin, the shanks, and the toes which are yellow. The birds lay fairly large eggs, mostly light brown. The shape of the body is typical "dual purpose," well carried and well set on short stout legs. The birds are loosely feathered, and active but not excitable in temperament (Fronda, 1924). They show, however, a tendency to decrease in vitality, but by careful mating this apparently decreasing constitutional vigor has been regained.

In addition to these characteristics, table 1 gives a general idea of the other improvements attained by the College strain of the Cantonese during the short period of seven years. The figures under the column "Original stock" were taken from the results of Lindayag's (1918) comparative studies of Cantonese and Native chickens, while those under the column "Present stock" were compiled from records of the College flock in 1923–1924.

HOW THESE IMPROVEMENTS WERE ATTAINED

In the beginning of the work with the Cantonese chicken a systematic mass selection was practiced by the junior author, then directly in charge of the poultry work of the College. This blazed the trail in the development of this excellent breed of fowls which may play an important rôle in the advancement of the poultry industry in the Philippines.

Selection for size and body conformation as well as standard coloration of plumage was made, and none but the average-sized eggs were incubated. The selection was not rigid in so far as superior individuals were concerned, but the extremely small birds, those that were off-color and those that

possessed certain obvious disqualifications, such as presence of feathers on the shanks, and improperly formed combs, were excluded from the breeding pens. This early work with the Cantonese has served a number of purposes, the chief being the laying of the good foundation upon which the present strain has been built.

TABLE 1

Showing comparative figures about the original and the present flocks of Cantonese in the College of Agriculture

CHARACTERS COMPARED	ORIGINAL STOCK	PRESENT STOCK
1. Weight of eggs:		
Pullets' eggs	36.16 grams	40.78 grams
Hens' eggs	——	46.56 grams
2. Weight of baby chicks	26.50 grams	29.20 grams
3. Length of maturity	248.20 days	218.80 days
4. Weight of mature fowls:		
Females: Pullets	1.00 kgm.	1.43 kgm.
Hens	——	1.81 kgm.
Males: Cockerels	1.40 kgm.	1.90 kgm.
Roosters	——	2.50 kgm.
5. Average production per year:		
Pullets	29.8 eggs	109.7 eggs
Hens	——	94.4 eggs

Selection for egg production was not carried out until about four years ago, and until within the past two years, the selection for this important character was not rigidly made. A glance at table 2 will reveal the fact that in spite of the rather "loose" method of selection during that period, the rate of egg production of the Cantonese has gradually increased.

TABLE 2

Showing the average annual egg production of the Cantonese flocks of the College from 1917–18 to 1923–24

YEAR	PRODUCTION		
	Pullets	Hens	Average
1917–1918	29.8	——	——
1918–1919	——	——	——[a]
1919–1920	——	——	——[a]
1920–1921	——	——	62.0
1921–1922	——	——	82.0
1922–1923	——	——	99.0
1923–1924	109.7	94.4	104.4

[a] No data available.

The first strict selection was made with the flock in May, 1922, when the flock of 1921-22 was culled. At the beginning, the flock consisted of

45 hens, 22 of which were later culled out. The Bureau of Agriculture, Manila, standard for the Cantonese (Lindayag, 1918) was strictly followed, that is, no birds other than those buff in color, possessing yellow skin, beak, shanks, and toes, and single combs were allowed to remain in the flock. In addition to these characters, the bird must have a weight equal at least to the average for the flock, and must have laid at least 30 eggs from January 1 to April 30 of that year.

As a result of this selection, the 1923–24 Cantonese flock of 23 hens of varying ages was made uniform in size, color of plumage, skin, shanks, and toes. Some of the hens, however, laid small eggs and some laid white, both being undesirable characters. None of these eggs found their way into the incubators, and the birds that were laying very small eggs, irrespective of the color of their plumage, were culled out, while those that laid larger eggs but only white-shelled ones were allowed to remain for the production of market eggs.

Because some of the hens that passed the 1922–23 test had not come up to expectation, another culling was made of this flock at the beginning of the year 1923–24, at which time the "boarders" were removed. At this culling, the annual egg production standard was made 60 eggs, and as a result, our original flock of 45 birds in 1921–22 was reduced to only 15 hens in 1923–24. All pullets hatched in 1922–23 were pedigreed and in addition to the 15 original hens, the 25 selected pedigreed pullets hatched in 1923–24 made up the Cantonese flock of the College in 1923–24. These 15 hens averaged 94.4 eggs each, and these 25 pullets averaged 109.7 eggs each in 1923–24. These figures are rather low, but they are a considerable improvement, and probably one of the best that has ever been recorded of the Cantonese.

No better results of these two successive cullings could be desired than are shown by the present flocks of Cantonese in the College. In plumage, skin, shank, and toe color, the birds are very uniform; in size, they are fair; and in egg production, superior to any local record known. The present stock of Cantonese has been improved by continuous inbreeding, although not as close as "sib-mating" or the mating of full sisters and brothers. They have all been good enough to go through all these years under the most trying of conditions and after passing the last two rather strict selections.

PLANS FOR FURTHER IMPROVEMENT

In addition to the standard that is being followed in all selection work for further improvement of this breed (Fronda, 1924), efforts are being made to raise the average production of the flock to about 200 a year. As the fowls are fairly well inbred now it is doubtful whether progress in the future will be as rapid as it has been in the past. At present, there is not a single Cantonese hen in the College flock that did not lay at least 84 eggs in 1923-24, the range being from 84 to 179 eggs in a year.

The size and color of the eggs produced are still taken into consideration, and care is exercised that none of the undesirable eggs are incubated. The color of the plumage is also examined carefully before the bird is used as a breeder. The breeders are carefully fed with up-to-standard mixtures of feeds of good quality to insure the production of strong chicks. The chicks are very carefully brooded and the early maturing individuals are given every possible chance to develop into healthy, vigorous mature fowls.

OUR GOAL

The goal aimed at in this work is the development of a breed of fowls that is well suited to tropical conditions. It appears as though the improvement of the local poultry industry through importation of standard bred chickens from the United States or elsewhere has little promise of success. But the Cantonese fowl has shown by actual performance its adaptability to Philippine conditions; it remains very hardy, and feels at home under practically any environment,—in the city, town, barrio, or on the farm.

In many respects, the College strain of the Cantonese is very much better than the Native fowl. It is larger and more meaty, produces larger eggs, is more uniform in color and body type. Also, the Cantonese chickens are easier to keep together, as they do not range as far away from the owner's home as do the Native fowls. Another advantage of the Cantonese fowl over the Native is its inability to fly high, hence there is not the annoyance of the chickens flying up into the owner's house and being a constant source of trouble. Still another advantage of the Cantonese over the Native is its adaptability to intensive culture, as of all the breeds of fowls that have been kept in the College, the Cantonese has given the best promise of adaptation to rather intensive poultry raising. The Native fowl is not an exception to this statement.

SUMMARY

1. It has been possible through inbreeding to improve to a considerable degree the College flock of Cantonese fowls.

2. Mass selection in the early part of the work served to produce the strong foundation stock upon which inbreeding has been practiced.

3. The rate of increase in the number of eggs produced by the Cantonese flocks in the College shows that the time may come when "200-eggers" may be common in the College flocks of this breed.

4. Because of their adaptability, the Cantonese fowls may become an important factor in the development of the poultry industry in this country.

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Fig. 1.—Cockerel C21. A promising young Cantonese cockerel. Ideal for color and body type. Hatched in 1925.

Fig. 2.—Pullet C132. Ideal for body type and color of plumage and skin, shanks, and beak. Hatched in 1925.

PLATE I

Fig. 3.—Pullet C132. Showing one of the wings spread to show the general character of the Cantonese color.

Fig. 4.—Pullet C3. A good type for yellow shanks and beak, but off-color in plumage. To secure uniformity in the flock such birds are culled. Hatched in 1925.

PLATE II

REPORT OF A TRIP TO THE LANZON REGIONS IN LAGUNA[1]

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The students in Tropical Pomology and I made a trip to San Pablo, Rizal, Nagcarlan, and Lilio on October 2, 1926. We observed the bearing characteristics of the lanzon trees growing along the road. Only a few of the fruits were ripe; those that were sold in the market in the last week of September had been gathered from early bearing trees. In San Pablo the selling price of one *kaeng* (a crate containing approximately 2000 fruits) of lanzons was from ₱7.00 to ₱8.00; in Nagcarlan the price was a little lower. In times of abundance the selling price is only ₱3.00 a crate.

We visited the Lanzon Station in San Pablo where Mr. F. Q. Abaya, the man in charge, gave us some information about his work. He told us that the seeds are sown in seed beds, and the seedlings transplanted in the nursery when a year old. Two or three years later, these seedlings are grafted. At this age the diameter of the stock varies from six millimeters to one centimeter. The point of incision on the stock is from thirty centimeters to about one meter above the ground. The scion is taken from the mature branch, usually about one and one-half to two years old. Lanzon is propagated also by marcottage to a very limited extent.

Lanzon trees are generally found growing in coconut plantations. The distance between the trees varies from three to six meters. These are seedlings trees that have grown from seeds dropped by men and birds, which accounts for the irregularity of the spacing.

Because of the time-honored custom of letting these accidentally planted lanzon trees grow in coconut plantations, the growers believe that they do not grow well in the open orchards. But I am inclined to think that these plants may be cultivated in the open ground provided the climatic and soil conditions are favorable. However, a little shade may be desirable during the first few years so as to allow the plant to establish a good root system. My opinion is based, largely, on the fact that in orchards there are lanzon trees growing which overcrown the neighboring trees, and produce more spreading branches than those growing in coconut plantations. The lanzon trees in shady places are upright growers, and consequently have more compact crowns.

The lanzon is usually propagated by seed. The seeds are disseminated by man and birds and other animals. The seedling trees sometimes come

[1]Experiment Station contribution No. 409. Received for publication October 18, 1926.

into bearing at the age of 10 to 15 years, but generally require 12 to 15 years. Sometimes trees have been known not to bear fruit until 20 to 25 years old. It is said that the wider the space between trees the sooner they come into bearing. Six meters is considered a good spacing distance for lanzon trees. We are told that a marcotted branch bears fruit two years after planting, and a grafted tree begins to flower at the age of four years.

In most cases lanzon trees are said to be irregular bearers. As with a few other tropical fruit trees they bear heavily one year, and the next year yield a light crop or none at all. Probably by grafting and other asexual methods of propagation we may be able to improve the bearing conditions of these plants, producing trees that will bear heavily and regularly. Also it may be possible to produce fruit with comparatively small seeds or even seedless fruits.

The flowering season in San Pablo begins in April and lasts till June. According to Mr. Tomas Vista, the flowering season in Rizal begins in May and lasts till July. In Nagcarlan, the Municipal President told us that the trees in that district begin to flower in June and continue till August. In Lilio, according to Mr. Mariano Noble, a lanzon grower, some trees come to flowering in June and others not until September. The differences in the time of flowering may be due to the different elevations in which the trees are located. As with other plants, lanzon trees on the lower elevations bear earlier than those on the higher altitudes. Commonly, the fruits mature about five months from the time of flowering. Trees growing near running water, however, may be found fruiting as late as December and January.

The fruits are borne in clusters along the trunk and branches of the trees. The clusters are from ten to eighteen or twenty centimeters in length, and each carries from five to twenty-five fruits and occasionally one may contain thirty or more. The clusters are attached close to the stems, and the individual fruits are packed together in small clusters. The fruit is oval in shape and when fully ripe its rind becomes straw-yellow in color. The rind is comparatively thin and encloses five segments, one or more of which contain one seed, although some seedless fruits are found. In Lilio we found several trees in Mr. Noble's yard bearing sweet large fruit with comparatively small seeds. He told us that a buyer made a contract with him when two of his trees were still in bloom, paying him ₱50.00 for this season's crop. Mr. Noble said that the man had gathered ten crates, and there was more fruit to be harvested. Because the trees happened to be bearing earlier than others, the fruit was sold for from ₱12.00 to ₱15.00 a crate. According to Mr. Noble a buyer sometimes gets more than three times as much as is paid for the fruit when the contract is made while the trees are still in flower. It may be noted, however, that the buyer takes care of the trees from the time the fruit begins to mature.

A fairly good bearing tree usually produces from two to four crates. Large trees, about seventy to ninety years old, produce as much as five crates of fruit.

I was told that since good roads have been constructed, owners of lanzon trees have gradually learned to appreciate the money value of their trees. Many said that they formerly cut down the trees for the trunk to use for making sledges and for other purposes. Any one could gather the fruits without asking permission from the owner. Even now as a general thing the lanzon trees receive no cultural attention, except when they are seen to bear flowers. No one could tell us the accurate age of his trees in years.

We saw large trees which could be made to produce heavier crops and to live longer if certain practical knowledge in pomology were applied. Many trees are in unsound condition because of accidental breaking of branches, bark injuries, and improper cutting of branches. The survival of the fittest apparently prevails in the plantations we visited. *Loranthus philippensis* is not uncommon on old trees. This plant parasite causes a considerable damage on neglected trees.

The trees are shallow rooted plants, and they are easily blown down by storms if they are not protected. They are said to be safe in coconut plantations.

When they come to maturity, the fruits are commonly destroyed by fruit bats. The damage may reach 100 per cent, if the trees are not guarded. The best way to exterminate these animals is to shoot them. The fruit can be saved also by keeping the trees well lighted at night, by hanging at least two lamps in a tree.

It is said that the best variety of lanzon is produced in Paete, and Manaol is also considered an important shipping district. Both towns are in Laguna. In Cavite there are districts which produce excellent fruits. Lanzon is also grown in Misamis, Zamboanga, Cebu, and Sulu archipelago. According to Mr. Saji Alfad, a teacher from Jolo, the fruit is sold cheaper in Jolo than in any region in Luzon. A hundred fruits are usually sold for only ten centavos.

I have collected some cuttings of lanzon from San Pablo, Rizal, and Lilio. These cuttings will be grafted to our stocks in the College Nursery. In order to get some seeds of lanzon we bought one crate of fruit. The seeds were planted in the nursery.

A REVIEW: "A MANUAL OF PLANT BREEDING FOR THE TROPICS." [1, 2]

Just off the press, we have before us the book on plant breeding by Dr. Nemesio B. Mendiola of the faculty of this College. The book is the culmination of the author's experience in teaching and research in the Philippines, and marks the first attempt to bring together into a volume facts about plant breeding in the tropics.

The book is designed primarily for use by college students who have had the elementary principles in genetics and for researchers, but its chapters on staple and minor crops and ornamentals will be of great value to reading farmers and horticulturists.

There are thirteen chapters in the book. The first three bear on the history and importance of plant breeding, a review of genetic facts and a discussion of general methods of plant breeding. Chapter IV gives the reader a clear understanding of experimental errors in plant breeding arising from various factors, and how to lessen them. Figures from actual experiments are presented and the processes involved in calculating the probable error are given. For scientific workers this chapter should be of inestimable value.

The other nine chapters deal with the breeding and improvement of crops and ornamentals, separate chapters being devoted to rice, sugar cane, corn, tobacco, coconut, and abaca. A chapter on minor crops covers sweet potato, cassava, coffee, rubber, cacao, cotton, and vegetables. Under fruit improvement, banana, papaya, mango, lanzon, pineapple, citrus fruits, and other fruits of minor importance are included. Such plants as San Francisco, ornamental hibiscus, rosal, and other ornamentals, wild and cultivated, are discussed under ornamental plants. The different methods of selection and breeding practiced in the Philippines and elsewhere are given and the results of investigation along these lines from various sources are presented in a most comprehensive manner, yet in sufficient detail to be of practical value.

The book as a whole may be pronounced as an exhaustive exposition of plant breeding methods and practices as applied to crops cultivated in the tropics. The universality and authoritativeness of the book are greatly strengthened by a list of bibliography covering sixteen pages. The index which is well classified and very complete makes the work a valuable reference book.

A larger number of illustrations would have added to the value of the book and it is hoped that in future editions more plates and figures will be included.

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[1] Mendiola, Nemesio Blanco. 1926. A manual of plant breeding for the tropics. xxviii+365 p., 54 fig. Manila: Bureau of Printing.

[2] General contribution from the College of Agriculture, No. 179.

THE COW

(This gem was presented at a banquet recently given by the Holstein Friesian Association of Canada.)

The cow is a female quadruped with an alto voice and a countenance in which there is no guile. She collaborates with the pump in the production of a liquid called milk, provides the filler for hash, and at last is skinned by those she has benefited, as mortals commonly are.

The young cow is called a calf, and is used in the manufacture of chicken salad.

The cow's tail is mounted aft and has a universal joint. It is used to disturb marauding flies, and the tassel on the end has unique educational value. Persons who milk cows and who come often in contact with the tassel have vocabularies of peculiar and impressive force.

The cow has two stomachs. The one on the ground floor is used as a warehouse and has no other function. When this one is filled, the cow retires to a quiet place where her ill manners will occasion no comment and devotes herself to belching. The raw material thus conveyed for the second time to the interior of her face is pulverized and delivered to the auxiliary stomach, where it is converted into cow.

The cow has no upper plate. All of her teeth are parked in the lower part of her face. This arrangement was perfected by an efficiency expert to keep her from gumming things up. As a result, she bites up and gums down.

The male cow is called a bull and is lassoed along the Colorado, fought south of the Rio Grande, and shot in about the south-eastern extremity of the U. S. A.

A slice of cow is worth eight cents in the cow, fourteen cents in the hands of packers, and two dollars forty cents in a restaurant that specializes in atmosphere.

—*Live Stock Bulletin, May, 1926,* (Australia.)

A BIBLIOGRAPHICAL INDEX OF THE COLLEGE OF AGRICULTURE CONTRIBUTIONS ON AGRICULTURAL CROPS[1]

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The bibliography here presented covers the results of the experiments and the investigations on various crops that have been published in the College journal. All of this work has been done and released by the College Staff. Publication began January, 1911, when the first issue of the THE PHILIPPINE AGRICULTURIST under the name of THE PHILIPPINE AGRICULTURIST AND FORESTER appeared. The present name THE PHILIPPINE AGRICULTURIST was adopted in 1919.

From time to time requests for literature on Philippine crops are received. Primarily, it is in answer to such requests that this list of articles was compiled; incidentally, the index will guide research workers on tropical crops in the work that has been accomplished by this College and published in its own journal. The index is arranged under crop subjects. The articles are listed chronologically and in paging sequence in each volume. Phases of agricultural problems other than crops that have appeared in THE AGRICULTURIST are not included. It is the plan to publish a bibliographical index of experiments on nutrition, feeds and feeding, and live stock, as a second installment. The list here given does not by any means include all published work on crops from this College. Contributions on tropical crops by faculty members have appeared in local periodicals and newspapers and in various technical journals in other countries.

The index is arranged under the following heads:

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[1] Experiment Station contribution No. 410.

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1922—Mendiola, Nemesio B. Effect on banana fruit of premature appearance of the inflorescence. **10**: 299–300. *Pl. 1.*

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1912—Elayda, Inocencio. Annual report of farm work: Legumes and garden vegetables. **2**: 24–26.

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1915—Uichanco, Leopoldo Bancain. Some tests of tomatoes. **4**: 59–68: 70–80.

1916—Constantino, Agripino San Juan. A study of cowpea culture with special reference to selection in the "New Era" variety. **4**: 185–194.

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1919—Maceda, Felix Noroña. Selection in soy beans. **7**: 92–98.

1922—Yap, Severo G. The effect of season upon the culture of roselle. **10**: 405–406. (*Abstract by* Julian Agati.)

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1915—Luistro, Fernando D. Study of native coffee production. **4**: 153–161.

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1926—Villanueva, Aureliano J. Tannin plants of Maquiling region. **14**: 569–579.

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1922—Herbert, D. A. Cyanaphoric plants of the Makiling region. **11**: 11–16.

1923—Juliano, J. B. Additional cyanophoric plants of the Makiling region. **11**: 231–232.

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1925—Kalaw, Moises M., and Francisco M. Sacay. Some alleged Philippine poison plants. **14**: 421–428.

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1911—Cevallos, Felipe O. The collection of insects in connection with the study of economic entomology. **1**: 30–31. *Fig. 1–2.*

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1923—SARMIENTO, VALERIANO M. Insect carriers of Diplodia in storage-rots. **12**: 77–91.

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1924—BAKER, C. F. Second addition to Philippine and Malayan technical bibliography. **12**: 311–314.

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ABSTRACT[1]

Time of opening and closing of flowers on the College Campus. Fidel M. Reyes. (*Thesis presented for graduation, 1925, from the College of Agriculture No. 241; Experiment station contribution No. 411*).—This investigation consisted of observations and experimentation on the opening and closing of flowers on the College Campus from June, 1923, to February, 1924. The opening and closing of flowers are accomplished in five different ways. In the first type, the corollas roll inward, as with the morning glory, *Ipomoea purpurea* (Linn.) Roth. In the second type, the corollas bend inward, as with colot-colotan, *Kosteletzkya batacensis* (Blanco) F.—Vill. The third type is represented by the papilionaceous flowers, the opening and closing of which are accomplished by the voxillum. The fourth type is represented by the imbricate flowers in which the petals close consecutively. The fifth type is represented by the composite flowers, in which the opening and closing is done by the entire capitullum.

By following the necessary precautions, it was found that the early opening flowers closed early and the late opening ones closed late. Some opened as early as 3:00 a. m. and others as late as 10:00 a. m., while some closed as early as 10:00 a. m. and others as late as 11:00. p. m. By taking into account the closing time as well as the opening time, a floral clock, almost complete, can be arranged. The length of time the flowers remain open varies from two to fifteen hours in different species, *Sida cordifolia* Linn. having the minimum and *Merremia gemella*, (Burm. f.) Hallier f., the maximum period.

Except ammonia, the other gases, bromine and nitrogen dioxide had no effect on this behavior of the flowers. All, however, changed the color of the flowers. The flowers quickly responded to the tests for darkness, heat, and light.

The time of opening and closing was influenced by the lateness and earliness of the sunrise. During the months of the late sunrise, the flowers opened late, and during the months of early sunrise, the flowers opened early. It was also found that some flowers closed when rain came, and when it stopped they slowly opened. Strong wind closed the flowers, but a gentle breeze made them remain open, though the time to close had come. In exposed places the flowers opened earlier than on the low sheltered places, because the exposed places received light earlier than the low. The younger the flower the more responsive it was to the action of the environmental factors.

[1] Abstract prepared as part of the required work in English 6, College of Agriculture.

It was found that the flowers which opened and closed lasted a shorter time than those that did not.

The "Floral Clock" for the College Campus may be tabulated as follows: Opening time—Flowers that open between 6:00-6:30 a. m., water lily, *Nymphaca nouchali* Burm. f.; 6:30-7:00 a. m., lettuce, *Lactuca sativa* Linn.; 7:00-7:30 a. m., *Pisum sativum* Linn.; 7:30-8:00 a. m., *Commelina benghalensis* Linn.; 8:00-8:30 a. m., *Biophytum sensitivum* (Linn.) DC.; 8:30-9:00 a. m., *Merremia emarginata* (Burm. f.) Hallier f.; 9:00-9:30 a. m., *Gossypium hirsutum* Linn.; 9:30-10:00 a. m., golasiman, *Portulaca oleracea* Linn.; 10:00-10:30 a. m., *Triumfetta semitriloba* Jacq.; 10:30-11:00 a. m., *Sida retusa* Linn.; 11:00-11:30 a. m., none; 11:30-12:00 a. m., *Elephantopus spicatus* Aubl.; 12:00-2:00 p. m., none; 2:00-3:00 p. m., *Sida corylifolia* Wall.; 3:00-4:00 p. m., none; 4:00-5:00 p. m., *Lagenaria leucantha* (Duch.) Rusby; 5:00-7:00 p. m., none; 7:00-8:00 p. m., *Calonyction aculeatum* (Linn.) House; 8:00-9:00 p. m., dama de noche, *Cestrum nocturnum* Linn.; 9:00-12:00 p. m., none; 12:00-2:00 a. m., none; 2:00-3:00 a. m., cabello de angel, *Quamoclit pennata* (Desr.) Bojer; 3:00-4:00 a. m., *Cichorium intybus* Linn.; 4:00-5:00 a. m., morning glory, *Ipomoea purpurea* (Linn.) Roth.; 5:00-6:00 a. m., cowpea, *Phaseolus vulgaris* Linn.

Closing time—Flowers that close between 6:00-7:00 a. m., none; 7:00-8:00 a. m., *Operculina turpethum* (Linn.) S. Manso; 8:00-9:00 a. m., none; 9:00-10:00 a. m., *Ipomoea triloba* Linn; 10:00-11.00 a. m., Kibal, *Phaseolus vulgaris* Linn.; 11:00-12:00 a. m., sitao, *Vigna sinensis* (Linn.) Savi ex Hassk.; 12:00 m-1:00 p. m., lettuce, *Lactuca sativa* Linn.; 1:00-2:00 p. m., *Merremia gemella* (Burm. f.) Hallier f.; 2:00-3:00 p. m., morning glory, *Ipomoea purpurea* (Linn.) Roth.; 3:00-4:00 p. m., golasiman, *Portulaca oleracea* Linn.; 4:00-5:00 p. m., calamismis, *Psophocarpus tetragonolobus* (Linn.) DC.; 5:00-6:00 p. m., patola, *Luffa acutangula* (Linn.) Roxb.; 6:00-7:00 p. m., gomamela, *Hibiscus rosa-sinensis* Linn.; 7:00-8:00 p. m., trambolo, *Solanum cumingii* Dunal; 8:00-9:00 p. m., tomato, *Lycopersicum esculentum* Mill.; 9:00-10:00 p. m., radish, *Raphanus sativus* Linn; 10:00-11:00 p. m., *Merremia gemella*; 11:00-12:00 p. m., none; 12:00-6:00 a. m., dama de noche, *Cestrum nocturnum* Linn.: These thirty-five kinds of flowers could be planted as a dial of a "Floral Clock."

—*Abstract by Fidel M. Reyes.*

It isn't the work that wearies you,
As much as it is your mind,
The way you approach the things you do,
Expecting a dreary grind;
If you would view it with eyes of cheer,
As a pleasant task begun,
Like a mist in the morn, it would disappear,
And you'd smile when it was done.

—*The Kalends of The Waverley Press.*

EXCHANGE NOTES

Orchard heating, especially in many of the citrus growing sections of the state has come to be a recognized necessity. This of course applies to the more exposed parts of such sections. There are, however, none of these sections where heating is required every winter and herein is the reason why more citrus orchards are not equipped with heaters as well as also being the reason why some growers with such equipment occasionally fail to get it placed in their orchards in time for action * * *.

The Foothill Citrus Company at Azusa owns between 5,000 and 6,000 Kittle heaters and the officials of the company are confident that they do all that is expected of them. They use 40 to 50 of the heaters to the acre placing one between each two trees in alternate rows.

—*Cultivator* (California).

Dish pans, milk pails, gas tanks, lanterns, and auto radiators were soldered for their dads by members of the class in farm mechanics at the Momence, Illinois, high school recently. The work was done under the direction of Harold N. Hungerford, instructor in vocational agriculture.

—*The Prairie Farmer* (Illinois).

Practically all the early work on the nature and prevention of disease in plants was performed by University research men, working purely for the advancement of science. The results obtained were of such far reaching importance in practice that many handsome donations have been given by private individuals to the Universities in America to facilitate the prosecution of more extensive researches.

—*Journal of Agriculture* (South Australia).

Last spring, when little Julia Irish, thirteen years old, started work as a member of the Atlanta boys' and girls' corn club in Logan county, Illinois, she made the statement that the girls could beat the boys. She proved it recently when she was crowned junior corn king of the state at the sixth annual Illinois Seed Grain show. Julia won the right to the title when she took the grand sweepstakes prize in the junior classes on her ten-ear sample of yellow, utility type corn.

—*Successful Farming* (Iowa).

* * * There is no vegetable food so rich in protein and fat as peanuts and yet requiring so little preparation to make it edible and palatable. Roasted peanuts, of which thousands of tons are consumed annually, are a well-known and popular form, which is used to some extent in the preparation of breakfast foods, while large quantities are required by the confectionery trade. Peanut butter is also becoming more popular, while the oil may be used in cooking * * *.

—*Journal of the Department of Agriculture* (Union of South Africa).

The work carried out at Rothamsted, England, since 1918 has shown that under field experimental conditions an increased yield of 20 per cent. on the average may be expected when spring-sown cereals are subjected to high-tension electrical discharge, also that under both field and pot experiments electrification has accelerated reproductive growth (grain) much more markedly than vegetative growth (straw).

—*Journal of Agriculture* (New Zealand).

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* * * Doubtless the use of machinery would have much to do with securing efficiency on this farm. With that thought in mind, I asked him (owner), "What is the machine that is most useful to you in the operation of your farm?" Quickly he answered, without a sign of doubt, "My manure spreader is the most useful" * * *.

"I never let a forkful of manure touch the ground until it gets to the field," he said. "Whenever I clean the horse barn or the cow stalls or the hoghouse or chicken house, I load the manure directly into the spreader and haul it to the field."

This plan saves the work of handling the manure a second time as would be necessary if he piled it on the ground or put it in a pit before loading. It saves manure from leaching and thus a greater amount of fertility is taken to the fields than would otherwise be possible * * *.

"What are the principal essentials in caring for a spreader so that one can use it long enough to get his money out of it?" I questioned.

"I keep my spreader in the shed all the time it is not actually in use. I believe that exposure to the weather will damage a spreader more rapidly and more thoroughly than any other farm machine. I have never left my spreader out overnight. It has never been out in a rain and it has never been left standing in the sun, except when in actual use," he explained.

This man has used the same spreader for sixteen years and says that he expects it to last for that much longer. He has spent a few dollars for repairs. He has kept all the bearings well oiled and has not given them an opportunity to wear out * * *.

—*Successful Farming* (Iowa).

COLLEGE AND ALUMNI NOTES

The following opinion of our College is from *Tractor Farming* (Illinois):—

The College of Agriculture of the University of the Philippines is playing a very important part in the scientific development of Philippine agriculture. Though limited in funds and with numerous disadvantages and drawbacks, the faculty of this institution has developed a most creditable organization, both as regards personnel and equipment, and is doing an excellent work in training Filipino students in the science of modern agriculture, particularly as it applies to Philippine conditions. With the scientific knowledge of agriculture being imparted to its citizens, and with modern machines with which to carry out the best methods of soil preparation, tillage, and harvesting, the agriculture of the Philippines is inevitably destined to assume, in the very near future, the prominent position in the world's agriculture which Nature intended it should hold.

Mr. J. P. Romaine, rubber expert from Sumatra, and Mr. Francisco D. Marquez, B. Agr. '15, now with Philippine Bureau of Agriculture, were among recent College visitors.

A note from Doctor Gonzalez, delegate to the Pan-Pacific Congress meeting in Tokyo, written on ship from Hongkong to Kobe, says: "Had a chance to see the Hongkong dairy. This is the biggest dairy I have come across. They have pure Holstein and Ayrshire raised under artificial conditions."

Doctor Quibumbing, Fellow of the National Research Council working in Botany under Professor Merrill, Dean of the College of Agriculture, University of California, writes Dean Baker of his arrival in Berkeley on September 9, and that he is well started on his work which is centered on Philippine Flora.

The following is an extract from a letter recently received by Professor Yule from Doctor S. F. Trelease:

At the Botanical Congress in Ithaca the Filipinos arranged a very nice luncheon. McLean, Brown, McWhorter, Gates, Rands, LaRue, Herbert Copeland (a fine looking big fellow with a red mustachio), J. A. Agati, I. de G. Rodriguez, F. T. Adriano, and Alex. Gordon were there. I was delighted to see these former students and other friends from the Islands. * * *)

The twenty-third scientific meeting of the Los Baños Biological Club was held on October 28, 1926, in the College of Agriculture Auditorium. The following papers were read and discussed:

1. Dr. M. Mondoñedo and Mr. P. Bayan—"A comparative study of corn and cassava as feeds for hogs."
2. Dr. G. San Agustin—"Meat inspection work in relation to public health in the Philippines."
3. Dr. V. Villegas and Mr. A. D. Pablo—"A preliminary study on the dairy qualities of goats."

A public meeting of the Junior Agricultural Congress was held in the evening of October 30 in the Auditorium. Hon. M. C. Briones, Representative from Cebu, was guest of honor. His address, the theme of which was the value of the training given in this College, and the elements of character necessary to make this training of value to the graduate and to the country, was direct and effective, devoid of superfluous decoration. Each nail was hit squarely on the head.

In the open convention of the organization, three resolutions were presented, one by Mr. Moises Kalaw, one by Mr. Buenaventura Briones, one by Mr. Enrique Paller. The resolutions were well presented and the discussion was vigorous. Mr. Salustiano Gonzales, president of the society wielded the gavel with assurance and fairness.

At the close of the convention Doctor Toribio Vibar, Adviser of the Society, told something about the object and work of the organization. Miss Fraternidad Solita from Manila with a piano solo, and Mr. M. del Rosario with several selections on Hawaiian guitar, played with a swing, sweetness, and rhythm that was entrancing, added to the pleasure of the meeting.

Virgilio Pineda, who completed his work in October, goes to Bukidnon to open up a cattle ranch. Mr. Pineda makes the fifth of our graduates to join in the race for the title of "Cattle King of Bukidnon". The others are Mr. Florentino Cruz, '16; Mr. José Crisanto, '23; Mr. Nicasio Tuason, '23; and Mr. Celso Tuason, '26.

Mr. Santiago P. Lagoc, B. S. '25, writes that in Davao there are four College of Agriculture graduates: Mr. Emilio Feliciano, B. Agr. '25, fiber inspector under Bureau of Agriculture; Mr. Joaquin Maypa, B. S. '25, who has taken up a homestead and is also manager of a new agricultural enterprise; Mr. Paulino Menor, B. Agr. '26, and Mr. Lagoc who are employed on a plantation owned by Japanese. Mr. Lagoc has taken up a homestead.

Roll of honor for entire course at close of first semester:

First Year Preparatory:

1. Cuevas, Numeriano..... 1.73

Freshmen (B. Agr.):

1. Maifori, Ricardo..... 1.56

Juniors (B. S. Agr.):

1. Huliganga, Brígido A..... 1.88

Informal subjects are not included in the computation of averages, but passing the subject is required of every candidate. Several students, namely, Messrs. Benjamin Hollero, Delfin Suerte, Manuel Villano and Jesus Mamisao, have each an average better than 2, but are disqualified because they are given either a 4 or 5 in Physical Education or in Military Science.